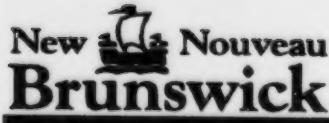


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**Natural Resources and Energy  
Minerals and Energy**

Mineral Resource Report

**PRELIMINARY REVIEW OF  
NEW BRUNSWICK'S  
MINERAL INDUSTRY  
1999**

Edited by  
Barbara M.W. Carroll

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**Preliminary Review of  
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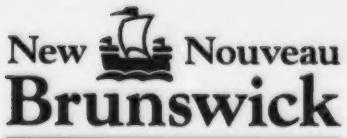
This report has been prepared by:

**Minerals and Energy Division**  
Department of Natural Resources and Energy  
Province of New Brunswick

**Hon. Jeannot Volpé**  
Minister of Natural Resources and Energy

March, 2000

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## TABLE OF CONTENTS

<b>Summary .....</b>	<b>iii</b>
<b>Sommaire .....</b>	<b>v</b>
<b>Exploration .....</b>	<b>1</b>
<b>Metallic Minerals .....</b>	<b>1</b>
Northern New Brunswick .....	1
Southern New Brunswick .....	6
<b>Industrial Minerals .....</b>	<b>8</b>
<b>Hydrocarbons and Underground Storage .....</b>	<b>9</b>
<b>Statistics .....</b>	<b>10</b>
Federal .....	10
Provincial .....	10
<b>Provincial Exploration and Development Initiatives .....</b>	<b>11</b>
<b>Mines and Quarries .....</b>	<b>13</b>
<b>Production Statistics .....</b>	<b>13</b>
<b>Metallic Minerals .....</b>	<b>15</b>
<b>Operating Mines .....</b>	<b>15</b>
Noranda Inc.–Brunswick Mine .....	15
Noranda Inc.–Heath Steele Mine .....	17
Caribou Mine Division of CanZinco Ltd. ....	17
<b>Suspended Operations .....</b>	<b>18</b>
ADEX Mining Corporation .....	18
APOCAN Inc. ....	18
Murray Brook Resources Inc. (a wholly owned subsidiary of NovaGold Resources Inc.) .....	18
<b>Industrial Minerals .....</b>	<b>18</b>
<b>Natural Stone .....</b>	<b>18</b>
Nelson Monuments Ltd. ....	18
Smith Cut Stone and Quarries Ltd. ....	18
Maritime Stone Works Inc. ....	18
Bastarache Stone Quarrie .....	18
Central Stone Company .....	19
<b>Mineral Aggregate .....</b>	<b>19</b>
<b>Gypsum and Anhydrite .....</b>	<b>19</b>
Mactaquac Mining Ltd. ....	19
Plaster Rock Gypsum and Manufacturing Limited .....	19
Canadian Gypsum Company Inc. ....	20
Westroc Industries .....	20
<b>Limestone and Dolomite .....</b>	<b>20</b>
Havelock Lime (a Division of Goldcorp Inc.) .....	20
Lafarge Canada Inc. ....	20
Brookville Manufacturing .....	20
Elmtree Resources Ltd. ....	20
Upper Kent Lime Works Ltd. ....	20

Kingsway Materials Ltd.	21
Potash	21
Potash Corporation of Saskatchewan Inc. (New Brunswick Division)	21
Potash Corporation of Saskatchewan Inc. (Cassidy Lake Division)	22
Salt	
Potash Corporation of Saskatchewan Inc. (New Brunswick Division)	22
Sulphur	
Irving Oil Limited	22
Silica	22
Chaleur Silica Ltd. (an Operation of Shaw Resources, a Member of The Shaw Group Limited)	22
Atlantic Silica Inc.	22
Peat	22
Jiffy Products (N.B.) Ltd.	23
Hydrocarbons	23
N.B. Coal Limited	23
Acknowledgements	23
Table 1. Summary of Mineral Exploration Expenditure Surveys	11
Table 2. Mineral Resource Allocation and Exploration Statistics, 1998 and 1999	12
Table 3. Mineral Production in New Brunswick, 1998 and 1999	14

#### ILLUSTRATIONS

Figure 1. Some exploration properties in New Brunswick, 1999	3
Figure 2. Mineral claims recorded, 1985–1999	13
Figure 3. Value of mineral production in New Brunswick, 1956–1999	15
Figure 4. Mines and quarries in New Brunswick, 1999	16

## SUMMARY

The preliminary value of New Brunswick's mineral production for 1999 is \$857 516 900, a decrease of 0.6% from the final value of \$862 992 354 for 1998. The loss of production from the closure of the Heath Steele mine was almost offset by a slightly higher average Zn price and a slightly lower Canadian dollar.

Metals accounted for 70% (\$597 933 574) of the total value of production. Of these, zinc, lead, silver, and copper made the largest contribution. Noranda Mining Inc. operated the No. 12 mine, the Heath Steele mine, and Belledune smelter. Operations continue to be suspended at the Caribou and Restigouche mines (Caribou Mine Division of CanZinco Ltd.), Mount Pleasant mine (ADEX Mining Corporation), Murray Brook mine (Murray Brook Resources Inc.), and the Lake George antimony mine (APOCAN Inc.).

Nonmetallic minerals contributed 22% (\$191 993 876) to the value of production. The main commodities are potash, peat, salt, and sulphur in smelter gas. In 1998, the Potash Corporation of Saskatchewan Inc. (New Brunswick Division) detected a small brine inflow in its mine near Sussex. By the latter part of 1999, considerable progress had been made in reducing the inflow. The company utilized its Cassidy Lake Division processing facility to upgrade standard-grade potash imported from Saskatchewan. Four limestone quarries were active: Saint John (Brookville Manufacturing), Havelock (Havelock Lime; Lafarge Canada Inc.) and Sormany (Elmtree Resources Ltd.). Upper Kent Lime Works Ltd. produced marl near Woodstock. Atlantic Silica Inc. and Chaleur Silica Ltd. produced silica from the Cassidy Lake and Bass River areas, respectively. Eighteen companies produced peat valued at \$57 557 627 from 33 bogs in New Brunswick.

Coal was valued at \$21 600 000. N.B. Coal Limited has continued to reclaim lands disturbed by mining.

Structural materials such as lime, stone, and sand and gravel contributed about 5% (\$45 989 450) to the value of production. Nelson Monuments Ltd. (Sussex), Smith Cut Stone & Quarries Ltd. (Shediac), Maritime Stoneworks Inc. (Dieppe), Brunswick Monuments Ltd. (Grand Falls), and Bastarache Stone Quarry (Notre-Dame) produced dimension stone in the province.

The focus of exploration in northern New Brunswick was base metals. Breakwater Resources Ltd. and Noranda Inc. reported the largest amount of exploration. Collectively, they spent \$6 500 000. Diamond drilling was carried out on a number of properties. Trenching and geophysical surveys were also conducted on some properties.

Precious metals and base-metal sulphides were the focus of exploration in southern New Brunswick where Frewest Resources Canada Inc., in the Canterbury area, obtained the following intersections in three target areas: 1.13 g/t Au over 23 m and 4.4 g/t Au over 6.3 m within a 13.4 m section that yielded 2.50 g/t Au, 0.84 g/t Au over 23.7 m and 1.10 g/t Au over 6.6 m. Thirty-two samples from the Clarence Stream area contained 0.09 g/t to 76.8 g/t (average 13 g/t) Au over several kilometres. Channel samples from one vein, which is up to 3 m wide, returned values up to 264.9 g/t Au; twelve channel samples from the same vein yielded an average of 42.3 g/t Au. Much interest has been shown in this and other areas in the region that may host additional intrusion-related gold occurrences.

James O'Neill found float containing 2.8 g/t Au with anomalous antimony on his Dead Creek claim group. In addition to finding high-grade visible gold on its Armstrong Brook property, Pro-Max Resources Inc. reported chip sample analyses of 7.75 g/t and 14.2 g/t Au over 3 m and 0.46 m.

J.A. Seglund Inc., RHT Enterprises Ltd., MariCo Oil and Gas Corporation, Corridor Resources Inc., and Jean Mariadassou held oil and natural gas licences to search in 1999. Irving Oil Limited held an oil and natural gas lease. A.A. (N.B.) Inc. held two bituminous shale development permits and Shell Canada Limited held a bituminous shale licence to search. St. Clair Pipelines (1996) Ltd. and Intragaz held one and six underground storage licences, respectively.

## SOMMAIRE

La valeur de la production minérale du Nouveau-Brunswick de 1999 se chiffre à 857516900\$, ce qui représente une diminution de 0,6% par rapport à la valeur finale de la production de 1998, qui avait atteint 862992354\$. La perte de production due à la fermeture de la mine Heath Steele a presque été compensée par le prix moyen légèrement supérieur du zinc et la légère baisse du dollar canadien.

Les métaux, principalement le zinc, le plomb, l'argent et le cuivre, ont représenté 70 % (597 933 574 \$) de la valeur totale de la production. La Noranda Inc. a exploité la mine n°12, la mine Heath Steele et sa fonderie Belledune. Les activités aux mines Caribou et Restigouche (Mine Caribou, filiale de la CanZinco Ltd.), à la mine du mont Pleasant (ADEX Mining Corporation), à la mine Murray Brook (Murray Brook Resources Inc.) et à la mine d'antimoine du lac George (APOCAN Inc.) sont toujours suspendues.

Les minéraux non métalliques ont représenté 22 % (191 993 876 \$) de la valeur totale de la production. Les principaux produits exploités sont la potasse, la tourbe, le sel et le soufre du gaz de four de fusion. En 1998, la Potash Corporation of Saskatchewan Inc. (filiale du Nouveau-Brunswick) a détecté la pénétration de petites quantités de saumure dans sa mine située près de Sussex. Vers la fin de 1999, la société avait réalisé beaucoup de progrès dans ses efforts visant à réduire la pénétration de saumure. L'entreprise a utilisé les installations de traitement de sa filiale du lac Cassidy pour améliorer de la potasse de qualité normale importée de la Saskatchewan. Quatre carrières de calcaire ont été actives, soit celles de Saint-Jean (Brookville Manufacturing), de Havelock (Havelock Lime, Lafarge Canada Inc.) et de Sormany (Elmtree Resources Ltd.). La société Upper Kent Lime Works Ltd. a produit de la marne près de Woodstock. L'Atlantic Silica Inc. et la Chaleur Silica Ltd. ont produit de la silice des secteurs du lac Cassidy et de Bass River, respectivement. Dix-huit entreprises ont produit de la tourbe évalué à 57 557 627 \$ à partir de 33 tourbières du Nouveau-Brunswick.

On estime la valeur de la production de charbon à 21 600 000 \$. La N.B. Coal Limited a continué à restaurer les terres perturbées par l'extraction minière.

Les matériaux de construction comme la chaux, la pierre, le sable et le gravier, ont représenté environ 5 % (45 989 450 \$) de la valeur totale de la production. La Nelson Monuments Ltd. (Sussex), la Smith Cut Stone & Quarries Ltd. (Shédiac), la Maritime Stoneworks Inc. (Dieppe), la Brunswick Monuments Ltd. (Grand-Sault) et la Bastarache Stone Quarrie (Notre-Dame) ont produit de la pierre de taille dans la province.

La prospection dans le Nord de Nouveau-Brunswick a principalement été axée sur les métaux communs. La Breakwater Resources Ltd. et la Noranda Inc. ont été les sociétés les plus actives à cet égard. Collectivement ils ont dépensé 6 500 000 \$. Des travaux de forage au diamant ont été exécutés sur un certain nombre de concessions. On a également effectué des fouilles en tranchées et des levés géophysiques sur certaines concessions.

Les métaux précieux et les sulfures de métaux communs ont constitué le principal objectif des travaux de prospection réalisés dans le Sud du Nouveau-Brunswick, où la Freewest Resources Canada Inc. a enregistré, dans la région de Canterbury, les recouplements suivants dans trois secteurs cibles: 1,13 g/t d'Au sur 23m et 4,4g/t d'Au sur 6,3 m à l'intérieur d'une section de 13,4m ayant titré 2,50g/t d'Au, 0,84g/t d'Au sur 23,7 m et 1,10g/t d'Au sur 6,6m. Trente-deux échantillons du secteur du ruisseau Clarence

renfermaient de 0,09g/t à 76,8g/t (en moyenne 13g/t) d'Au sur plusieurs kilomètres. Des échantillons en rainure provenant d'un filon ayant jusqu'à trois mètres de largeur, ont donné des valeurs pouvant atteindre 264,9 g/td'Au; 12 échantillons en rainure provenant du même filon ont titré une teneur moyenne de 42,3g/t d'Au. Les sociétés ont fait preuve de beaucoup d'intérêt à l'égard de cet emplacement et d'autres secteurs de la région qui pourraient abriter des venues aurifères apparentées à des intrusions.

M.James O'Neill a découvert des fragments rocheux détachés par altération contenant 2,8g/t d'Au avec une présence anomale d'antimoine sur son lot de concessions minières de la crique Dead. En plus de trouver de l'or visible à haute teneur sur sa concession du ruisseau Armstrong, la Pro-Max Resources Inc. a rapporté que des analyses d'échantillons prélevés par saignée ont affiché des teneurs de 7,75g/t et de 14,2g/t d'Au sur 3 m et 0,46 m.

La J.A. Seglund Inc., la RHT Enterprises Ltd., la MariCo Oil and Gas Corporation, la Corridor Resources Inc. et M. Jean Mariadassou étaient titulaires de permis de recherche de pétrole et de gaz naturel en 1999. L'Irving Oil Limited était titulaire d'un bail d'exploitation de pétrole et de gaz naturel. L'A.A. (N.B.) Inc. était titulaire de deux autorisations de mise en valeur de schistes bitumineux et la Shell Canada (Limited) était un permis de recherche de schistes bitumineux. La St. Clair Pipelines (1996) Ltd. et Intragaz étaient, respectivement, titulaires d'un et six permis de stockage souterrain.

# Preliminary Review of New Brunswick's Mineral Industry, 1999

## EXPLORATION

### METALLIC MINERALS

#### Northern New Brunswick

The annual telephone poll, taken in October, indicates that exploration expenditures in the northern half of the Province for 1999 are approximately \$7 000 000, whereas \$10 300 000 was reported for 1998. These figures compare quite closely with figures for all of New Brunswick—forecast 1999 expenditure was approximately \$7 400 000 and the final 1998 expenditures were approximately \$10 000 000 (Source: Natural Resources Canada). Northern New Brunswick generally accounts for about 90% of the total exploration expenditure in the Province. Statistics from the database of the Province's Recorder indicates that the number of new claims recorded in northern New Brunswick during 1999 was 1343 and the number of claims in effect at year's end was 12 368.

As in past years, most of the exploration activity in northern New Brunswick was focused on base metals in the Bathurst Mining Camp. The active major companies were Breakwater Resources Ltd. and Noranda Inc., which together spent about \$6 500 000. Teck Exploration Ltd., which was active in 1998, closed its office in Bathurst, effective the first of August. The active juniors were Black Bull Resources Inc., Chapleau Resources Limited, Eastmain Resources Inc., Fancamp Resources Ltd., Lewis Brook Resources Ltd., Northeast Exploration Services Limited, Omni Mines Ltd., PGE Resource Corporation and Slam Exploration Ltd., which collectively spent approximately \$500 000. All but three of these companies, Chapleau Resources Limited, Lewis Brook Resources Ltd. and PGE Resource Corporation received funding under the New Brunswick Exploration Assistance Program (NBEAP) for junior mining firms.

**Major Companies** Noranda Inc. accounts for most of the exploration expenditures in northern New Brunswick. In 1999, the company spent \$6 470 000 within the Bathurst Mining Camp, up \$1 600 000 over 1998. Approximately, \$1 000 000 of this total was spent on two-dimensional seismic surveys in the Brunswick belt. From east to west, Noranda's land holdings are concentrated in five belts: Key Anacon-Lawson Brook belt, Brunswick-Portage River belt, Heath Steele-Mountain Brook belt, Camel Back-Wedge belt and Upsalquitch-Half Mile Lakes belt (Figure 1: 1-5). Notably, Noranda dropped a large number of claims in the Forty Four Mile Brook-Rogers Lake area (Figure 1: 6) and staked only 81 new claims in seven blocks this year, all of them in the Bathurst Mining Camp.

In the Key Anacon-Lawson Brook belt (Figure 1: 1), Noranda drilled three holes, totalling 1890 m, to test subtle magnetic targets beneath Carboniferous cover rocks. In the Brunswick-Portage River belt (Figure 1: 2), 15 holes were drilled near the Brunswick No.12 mine, 8 from surface totalling 10 145 m and 7 from underground totalling 1936 m. Another 10 holes, totalling 5325 m, were drilled outside the mine area. Also, more than 150 shallow holes, totalling roughly 2000 m, were drilled in lieu of trenching to

---

### Legend

1. Claims, Key Anacon-Lawson Brook belt (Noranda Inc.)
2. Claims, Brunswick-Portage River belt (Noranda Inc.)
3. Claims, Heath Steele-Mountain Brook belt (Noranda Inc.)
4. Claims, Camel Back-Wedge belt (Noranda Inc.)
5. Claims, Upsilonquitch-Half Mile Lakes belt (Noranda Inc.)
6. Claims, Forty Four Mile Brook-Rogers Lake area (Noranda Inc.)
7. Claims, Wildcat (Northeast Exploration Services Limited)
8. Claims, Caribou North (Northeast Exploration Services Limited)
9. Claims, Tingley Brook (Eastmain Resources Inc.)
10. Claims, Sandburn (Eastmain Resources Inc.)
11. Claims, Railroad (Eastmain Resources Inc.)
12. Mining Lease, Captain North Extension deposit (Stratabound Minerals Corp.)
13. Claims, Chester (Northeast Exploration Services Limited); Chester (Bathurst Silver Mines)
14. Claims, Little Sevogle-Northeast (Wayne Carroll)
15. Claims, GIS (Northeast Exploration Services Limited)
16. Claims, Mount Baird (Northeast Exploration Services Limited)
17. Claims, Bills Lake (PGE Resource Corporation)
18. Claims, Nepisiguit Brook (Major General Resources Limited)
19. Claims, Sewell Brook (Chapleau Resources Ltd.)
20. Claims, Lewis Brook (Slam Exploration Ltd.)
21. Claims, Clarinda (Slam Exploration Ltd.)
22. Claims, Turgeon Deposit (Heron Mines Ltd.)
23. Claims, Copper Stake, Tower Hill (Kevin Smith)
24. Claims, Noel Grid (Lorenzo Noel)
25. Claims, Simpson (Michael Smith)
26. Claims, Malachite (Log House Construction Ltd.)
27. Claims, Simpsons Gulch, Royal Vault, Boland Brook, Boland Brook Centre, Indian Brook, Burntland Brook, Ritchie Brook, McKenzie Lake (A. Wayne Lockhart)
28. Claims, Golden Ridge (Freewest Resources Canada Inc.)
29. Claims, Clarence Stream (Freewest Resources Canada Inc.)
30. Claims, Browns Mountain (Fancamp Resources Inc.)
31. Claims, Dead Creek (Sheila Watters)
32. Claims, Armstrong Brook (Pro-Max Resources Inc.)
33. Claims, Springfield (Pat Marr)
34. Claims, Digdeguash (Peter Fenety)
35. Claims, Albright Brook (PGE Resource Corporation)
36. Claims, Jordan Mountain (Phelps Dodge Corporation of Canada Ltd.)
37. Claims, Hicksville (Goldcorp Inc.)
38. Claims, northwest of St. George (McMinn Pit Ltd.)
39. Claims, Taylor Village (Avard Hudgins)
40. Claims, Petitcodiac River (Avard Hudgins)
41. Bituminous shale development permits (A.A. (NB) Inc.)
42. Bituminous shale licence to search (Shell Canada Limited)
43. Underground storage exploration licence (St. Clair Pipelines (1996) Ltd.)
44. Underground storage exploration licences (Intralaz)
45. Oil and natural gas licence to search (Jean Mariadassou)
46. Oil and natural gas licences to search (RHT Enterprises Ltd.)
47. Oil and natural gas licences to search (Corridor Resources Inc.)
48. Oil and natural gas licences to search (MariCo Oil and Gas Corporation)
49. Oil and natural gas licences to search (J.A. Seglund, Inc.)
50. Oil and natural gas lease (Irving Oil Limited)

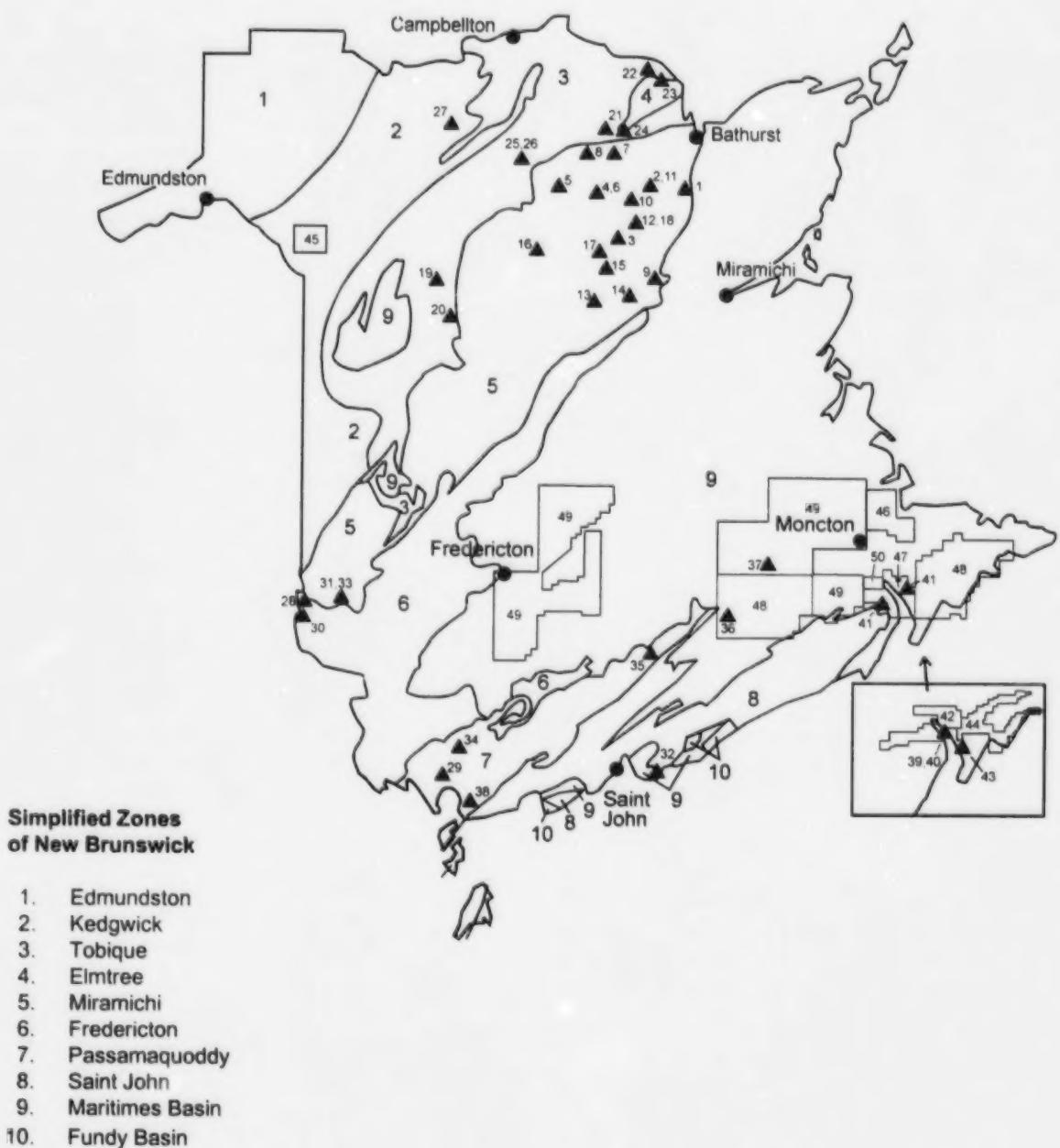


Figure 1. Some exploration properties in New Brunswick, 1999.

help elucidate the bedrock geology in the Brunswick–Portage River belt. In addition, five two-dimensional seismic lines were shot in this belt. In the Heath Steele–Mountain Brook and Camel Back–Wedge belts (Figure 1: 3, 4), no significant amount of work was done in 1999. In the southern part of the Upsalquitch–Half Mile Lakes belt (Figure 1: 5), ground preparations were made to extend the Halfmile Lake three-dimensional seismic survey to the southwest. However, the survey will not be shot until 2000. Deep drilling continues at Halfmile Lake to test the seismic targets identified in 1998. To date, 12 holes, including extensions to existing holes, have been completed bringing this year's total meterage to 15 597 m. In the northern part of the Upsalquitch–Half Mile Lakes belt, five scattered holes totalling 654 m have been drilled and another 800 m were planned before the end of 1999.

Breakwater Resources Ltd. and its wholly owned subsidiary, CanZinco Ltd., conducted limited exploration (totalling approximately \$50 000) in two areas during 1999, namely on the Wildcat and Caribou North properties (Figure 1: 7–8). The work included, respectively, 13.2 km and 4.7 km of induced polarization surveying.

**Junior Companies** Eastmain Resources Inc. spent approximately \$230 000 this year making it the second highest spender after Noranda Inc. Early in the year, Eastmain Resources Inc. focused on its Tingley Brook and Sandburn Brook properties (Figure 1: 9–10), in partnership with Bubbee Ventures Inc., which contributed \$150 000 toward the exploration program. Nine holes, totalling 1825 m, were drilled—six on Tingley Brook to test coincident soil geochemical and electromagnetic anomalies over favourable stratigraphy, and three on Sandburn Brook to test the strike extension of a known massive sulphide occurrence. One of the Tingley Brook holes cut 65 m of disseminated sulphides adjacent to a large magnetic anomaly in the southern part of the property.

Eastmain Resources Inc. also explored its wholly owned Railroad property (Figure 1: 11). Two grids, totalling more than 100 line kilometres, were cut on the Railroad property in 1998. Detailed mapping, ground geophysics (induced polarization and magnetometer) and trenching outlined three promising zones on this large property, namely Island Lake, Captain West and Railroad. At Island Lake, a 1600-m-long alteration zone at the Nepisiguit Falls–Flat Landing Brook contact was delineated by trenching and induced polarization. This zone was one of the stops on the annual spring field trip of the New Brunswick Prospectors and Developers Association. At the Railroad zone, located south of Captain West, a 1000-m-long induced polarization anomaly was delineated over strongly altered Nepisiguit Falls quartz porphyry that is overlain to the north by an iron formation and mineralized Flat Landing Brook fragmental rocks (BHP Minerals Canada Limited's Railroad discovery).

In mid-September, Eastmain Resources Inc. announced that it has made an agreement in principle with Stratabound Minerals Corp. regarding mining of the Captain North Extension (CNE) deposit (Figure 1: 12). In the early 1990s, Stratabound mined 39 000 t of ore from CNE and had it custom milled at Heath Steele. The grade of the mill feed (i.e., 11.1% Zn, 4.7% Pb and 150.86 g/t Ag) was found to be higher than the open-pit reserve estimate. Thus, Eastmain considers the remaining open-pit reserve (i.e., approx. 75 300 t of 7.3% Zn, 2.6% Pb and 89.1 g/t Ag) to be understated. With the closure of Heath Steele in 1999, future custom milling will have to be done at Brunswick No.12.

Black Bull Resources Inc. conducted an induced polarization survey on the Chester property (Figure 1: 13) and drilled two holes, totalling 550 m, to further test the lead–zinc zone near the old Chester Mines workings. Two shallow holes, totalling about 250 m, were also drilled on the Little Sevogle property

(Figure 1: 14) and one hole (150 m) was drilled on the GIS precious metal property (Figure 1: 15), which is under option from Northeast Exploration Services Limited.

Northeast Exploration Services Limited carried out preliminary exploration on its property in the Portage Lakes area (Figure 1: 16), south of the Restigouche deposit. Notably, the southern parts of this claim group, and an adjacent one held by PGE Resource Corporation, touch upon the recently proposed protected area (NB Central Highlands) adjacent to Mount Carleton Park. There are three proposed protected areas in northern New Brunswick.

PGE Resource Corporation recently completed a drill hole on its Bills Lake property (Figure 1: 17), north of Chester. Core was being logged in the latter part of 1999 so no results have been released.

Major General Resources Limited received an NBEAP grant to conduct further work on its Nepisiguit Brook property (Figure 1: 18) but did not carry out any work before the year's end.

Other listed companies that did not work on their claims in the Bathurst Mining Camp in 1999 are: Freewest Resources Canada Inc., Mountain Lake Resources Inc., NovaGold Resources Inc., Stratabound Minerals Corp., and Teck Exploration Ltd.

Outside the Bathurst Mining Camp, only four junior companies carried out work or expected to carry out work in 1999, namely, Chapleau Resources Ltd., Lewis Brook Resources Ltd., Slam Exploration Ltd., and Fancamp Resources Ltd. Earlier in the year, Chapleau Resources Ltd. drilled four more holes, totalling approximately 400 m, on its Sewell Brook base metal property (Figure 1: 19). However, later in the summer the company permanently closed the Plaster Rock field office and moved its equipment back to Cranbrook, British Columbia. Lewis Brook Resources Ltd. and partner Miramichi Minerals Ltd. also drilled four holes, totalling 640 m, earlier in the year on a base-metal property south of Mount Costigan (Figure 1: 20).

Slam Exploration Ltd. has nearly completed the process to become listed on the Alberta Stock Exchange. Once complete, the company plans to use its NBEAP grant to help drill off the Clarinda gold property (Figure 1: 21) near Lower Tetagouche Lake, which saw an extensive trenching program in 1998.

In 1998, Fancamp Resources Ltd. entered into a joint-venture agreement with Heron Mines Ltd. on the Turgeon Cu-Zn property (Figure 1: 22) near Belledune. A new grid was cut perpendicular to existing grids and a Quantec induced polarization survey was carried out that picked up the known mineralized zones (powerline and 100 m zinc zones), as well as a deeper anomaly just beyond the limits of existing drilling. Fancamp plans to test this anomaly with two or three drill holes but did not raise sufficient money to carry out this work before year's end.

**Prospectors** Fernand Robichaud and Kevin Smith found massive sulphide boulders in an esker west of Madran (Figure 1: 23), one of which contains high-grade copper. This boulder almost certainly came from the nearby Fournier Group but its bedrock source has not yet been identified.

Lorenzo Noel conducted additional trenching on his Arleau Brook property (Figure 1: 24) and uncovered a quartz zone near the location of the gold-bearing quartz boulders (assaying up to 29 g/t Au) that he found in 1998.

Mike Smith and George Chilian of Metalore Resources Limited carried out trenching and sampling on gold claims in the Simpsons Field area (Figure 1: 25) of the Tobique-Chaleurs Belt. The Lower Devonian Ramsay Brook gabbro is highly altered, locally sulphide rich and should have excellent potential to host porphyry Cu-Au mineralization.

Rufus Smith (Log House Construction Ltd.) held a property in the headwaters of Ramsay Brook along Highway 180 (Figure 1: 26), which also has excellent potential for porphyry Cu-Au mineralization. This property has been trenched but never drill tested.

In the latter part of 1998, Wayne Lockhart (Kedgwick Syndicate) acquired more than 500 claims to encompass part of the huge Ni-Co stream-sediment anomaly (up to 700 ppm Ni) that is east of Kedgwick (Figure 1: 27). The Syndicate includes Omni Mines Ltd., a private company that Wayne founded back in 1973, and a number of individual investors. In 1999, a detailed stream-sediment survey, comprising 700 samples collected at 500 m spacing, was completed with the help of NBEAP funding to Omni Mines Ltd. This survey apparently verified that the anomaly exists but the results are not yet public. The bedrock source of this Ni-Co anomaly remains unidentified.

### Southern New Brunswick

Exploration in southern New Brunswick was targeted mainly on precious metals and base-metal sulphides with emphasis on gold. Exploration continued to be active for industrial minerals and energy-related resources. Exploration expenditures are estimated to be \$740 000 for 1999, assuming that southern New Brunswick accounted for 10% of the total provincial expenditure reported by Natural Resources Canada (\$7 400 000: forecast for 1999). The Provincial Recorder's database indicates that the number of claims recorded in 1999 was 428 and the number of claims in effect at year's end was 2516.

The high potential for economic gold deposits, which are associated with a variety of geological environments in the southern part of the province, is becoming widely recognized. One of the most important is the recent discovery of impressive gold mineralization associated with certain Late Paleozoic granitoid rocks in a contact metasomatic environment. This discovery has reinforced previously proposed models suggesting that the contact zone of these intrusions provides excellent gold exploration targets. In a regional context, many of the gold-bearing vein, skarn and porphyry systems in this area appear to be associated directly or indirectly with broadly similar intrusions indicating the presence of an extensive, genetically related gold district. Other significant new gold discoveries associated with Hercynian fold-thrust belts that affect Neoproterozoic and/or Carboniferous rocks along the south coast of the province have also been located, highlighting the potential for gold in these environments as well.

Over the past year, Freewest Resources Canada Inc. has conducted exploration on two promising gold properties, Golden Ridge and Clarence Stream. On the Golden Ridge property (Figure 1: 28) in the Canterbury area, gold sourced in high-level, intermediate intrusions and enriched along a major fault zone occur within an Ordovician felsic to intermediate volcanic pile. The company completed a ten-hole diamond-drilling program, following up on three main targets outlined by soil geochemistry and trenching. In the first target area, a broad mineralized zone up to 60 m wide contained numerous gold intersections, including one with 1.13 g/t Au over 23.0 m and another with 4.40 g/t Au over 6.3 m within a 13.4 m section that yielded 2.50 g/t Au. In the second area, a similar zone was found with up to 0.84 g/t Au over

23.7 m. The third area also returned several good intersections, the highest of which was 1.10 g/t Au over 6.6 m.

Freewest also acquired the Clarence Stream gold property (Figure 1: 29) that was found by Reginald Cox in 1998 after following up government detailed mapping and regional stream-sediment sampling surveys. There, gold with arsenopyrite and stibnite occurs along the northwestern contact of the Saint George Batholith for at least 4 km. Gold is present as disseminations in altered granodioritic rocks of the batholith, and in deformed sedimentary and gabbroic rocks within the contact aureole. Samples from float, subcrop and outcrop from initial prospecting returned values of 13 g/t Au averaged over 32 samples with values ranging from 0.09 g/t to 76.8 g/t over a distance of several kilometres along the contact. High-grade visible gold is present in late cross-cutting quartz veins. Channel samples from one vein, which is up to 3 m wide, returned values up to 264.9 g/t Au, and twelve 0.5 m-long channel samples from the same vein yielded an average of 42.3 g/t Au. Numerous companies and prospectors are currently staking claims in the region to cover other prospective areas that could host additional, intrusion-related gold occurrences.

Fancamp Resources Ltd. conducted preliminary work including prospecting, trenching, reconnaissance induced polarization, and soil-sampling surveys on its Browns Mountain property (Figure 1: 30) in the Canterbury area, east of Freewest's Golden Ridge property. The property straddles two major fault zones and contains altered intermediate to felsic intrusions like those in the vicinity of Golden Ridge. Several samples of float yielded anomalous gold, and trenching uncovered numerous silicified and sulphide-rich, angular boulders with arsenopyrite and gold enrichment. These are very similar to mineralized samples from Golden Ridge.

Several other companies/prospectors have been conducting grass-roots exploration for gold in the Canterbury area with some promising results. For example, on the Dead Creek claim group (Figure 1: 31), John O'Neil found float containing 2.8 g/t Au with anomalous antimony. Similar locally derived, high-grade, massive sulphide boulders found previously near this locality also have been found near major gold occurrences in the region.

Pro-Max Resources Inc. has substantially enhanced the exploration potential on its Armstrong Brook property (Figure 1: 32) in the Hercynian thrust-fold belt south of Saint John. In addition to 3-m- and 0.46-m-long chip samples (grading 7.75 g/t and 14.2 g/t Au, respectively) from one thrust zone, numerous and widely distributed outcrops with high-grade visible gold were found along strike for about 3.5 km. Two main mineralized zones within this area returned assays up to 53.5 g/t and 23.1 g/t Au. Further, the highest airborne radiometric anomaly is associated with this mineralized structure. In this region, airborne radiometric anomalies are generally associated with gold deposits.

Other than the gold environments mentioned above, there are some new areas that warrant investigation, including alluvial/fluviatile sedimentary sequences in Carboniferous strata and subaerial volcanic terrains in Neoproterozoic rocks along the south coast. It has been shown this year that there may have been a widespread, auriferous mineralizing event associated with hot spring activity during the latter part of the Early Carboniferous in addition to paleoplacer potential. Preliminary work by Southfield Resources Ltd. and Pro-Max Resources Inc. has found evidence of epithermal, high-sulphidation styles of alteration associated with sinterly jasperoid and barite veining as well as with stratiform, silica-rich horizons. Historical research by these companies indicates extensive exploration and some production from these environments in the past century.

Ongoing work on epithermal gold systems within Neoproterozoic terrains in southeastern Newfoudland highlights the potential for similar deposits in correlative terrains in southern New Brunswick. Although there are numerous indications that this type of mineralization could be present in New Brunswick, little work has been conducted toward that end.

Some exploration for base metal sulphides was conducted in the southern part of the Province. Government personnel involved in a 1:10 000 scale bedrock geological mapping survey, in conjunction with Patt Marr, have succeeded in outlining the potential productive horizon for volcanogenic massive sulphide deposits on his Springfield property (Figure 1: 33) near Canterbury. Massive sulphide clasts and massive and disseminated mineralization in breccias are associated with an extensive, Lower Ordovician, mainly felsic volcanic unit that contains maroon iron formation. Peter Fenety, on his Digdeguash property (Figure 1: 34) west of St. George, continued collecting samples in the area for geochemical analysis. Stratiform copper- and zinc-bearing basalt flows on the property contain anomalous platinum group elements, cobalt and gold, which could represent part of an extensive mineralizing event active during Late Silurian time in southwestern New Brunswick.

Other active companies include PGE Resource Corporation and Phelps Dodge Corporation of Canada Ltd. PGE continued to work on the Albright Brook property (Figure 1: 35) in the Annidale area that has high potential for economic gold and base-metal sulphide deposits. Work included a large soil-sampling survey, a magnetic and VLF electromagnetic survey, prospecting and rock sampling. Phelps Dodge staked claims in the Jordan Mountain area (Figure 1: 36), which also has potential for these commodities. A minor amount of grass-roots exploration was conducted on this property.

## INDUSTRIAL MINERALS

In 1999, industry-initiated exploration directed at New Brunswick's industrial rock and mineral resources in New Brunswick was centered on high-calcium limestone, diatomaceous earth, silica, and titanium.

Limestone deposits of the Carboniferous (Lower Viséan) Windsor Group in southern New Brunswick continued to be the target of exploration. Havelock Lime, a division of Goldcorp Inc., has been evaluating an interesting limestone property (Figure 1: 37) a few kilometres north of its Havelock processing facility in conjunction with the development of a new specialty lime product. In 1998, the company acquired a 20 000 t bulk sample from a small test quarry on the property and subsequently undertook a 2800 m diamond-drilling program in the fall of 1999 to verify long-term reserves. If successful, calcined lime production at Havelock could increase by several tens of thousands of tonnes annually and result in a capital investment of \$3–\$4 000 000.

Industrial rock and mineral exploration activity was also reported from southwestern New Brunswick in 1999. A number of mineral claims were established northwest of St. George (Figure 1: 38) where McMinn Pit Ltd. is investigating fine-grained silica and diatomaceous earth found on the floor of a few eutrophic lakes and adjacent bogs.

Last year, Avard Hudgins staked claims in southeastern New Brunswick to investigate the paleoplacer and placer potential for titanium in Carboniferous rocks and the Petitcodiac River estuary (Figure 1: 39,

40), respectively. Uranco Minerals Inc. conducted sampling and analytical programs in these geological environments with emphasis on the former locality. Work returned disappointing results, in that titanium in both environments was low-grade and found only in ilmenite.

In the area of industrial mineral research, W.J. Wilson and Associates of Saint John has been investigating various process technologies to manufacture several primary and secondary products from the Province's indigenous limestone, salt and potash resources.

## **HYDROCARBONS AND UNDERGROUND STORAGE**

A.A. (NB) Inc., a New Brunswick company wholly owned by a Malaysian parent company, holds two bituminous shale development permits south of Moncton in the Albert Mines and Dover areas (Figure 1: 41). These permits have a total land area of 1077 ha. In 1999, the company carried out a shallow core hole drilling program on both permit areas.

Shell Canada Limited completed a 9-hole core drilling program (total length of 6200 m) on its 25 000 ha bituminous shale licence to search in the Memramcook–Rosevale area (Figure 1: 42). All holes were wireline logged and organic-rich intervals were sampled and analyzed by Rock-eval pyrolysis. Following a major corporate restructuring, the company cancelled its licence to search at the end of the first year (June 25, 1999).

All construction activities for the main natural gas pipeline from Sable Island have been completed. The pipeline, which is routed through southern New Brunswick, has precipitated the search for potential underground storage sites in New Brunswick.

St. Clair Pipelines (1996) Ltd. of Chatham, Ontario holds an 895 ha underground storage exploration licence in the Dorchester area (Figure 1: 43). The area is underlain by a Windsor Group salt body. St. Clair continues to assess the potential of the site.

Intragaz, from Trois-Rivières-Ouest, Quebec, currently holds some 27 800 ha in underground storage exploration licences in southeastern New Brunswick (Figure 1: 44). The company was granted two additional exploration licences in 1999. The licence areas are: Baie Verte (628 ha), Sackville (7 457 ha), Port Elgin-Coppermine (15 363 ha), Uniacke Hill (650 ha), Jolicure (2 356 ha) and Point de Bute (1 347 ha). All licences are in good standing and the company is assessing the geological and geophysical data available for the salt bodies under the licences.

Presently, 630 722 ha of land in New Brunswick are held under a number of oil and natural gas licences to search and leases. Five companies hold licences to search: Jean Mariadassou (10 521 ha, southeast of Edmundston), RHT Enterprises Ltd. (32 886 ha, northeast of Moncton), J. A. Seglund, Inc. (22 638 ha, south of Moncton), Corridor Resources Inc. (180 522 ha, southeast and southwest of Moncton), and MariCo Oil and Gas Corporation (381 999 ha, south and northwest of Moncton and near Fredericton). An oil and natural gas lease was held by Irving Oil Limited (2153 ha, south of Moncton).

Jean Mariadassou, an independent, continued to assess the results of drilling a well in slate and limestone of the Matapedia Group southeast of Edmundston (Figure 1: 45).

Subsequent to cutting a section of crystalline basement at a depth of 960 m, RHT Enterprises Ltd. applied to suspend drilling at RHT Lakeside #2 well located near Lakeville (Figure 1: 46).

Corridor Resources Inc. from Halifax, Nova Scotia, currently holds in excess of 180 500 ha under licence to search. Four licences are located in the Sackville Subbasin southeast of Moncton, while five are located in the Moncton Subbasin west and southwest of Moncton (Figure 1: 47). In 1999, the company undertook a three-line 28.5 km seismic program in the Fairfield-Woodhurst area. Later in the fall Will DeMille #1 well northwest of Elgin was spudded.

MariCo Oil and Gas Corporation, with an office in Fredericton, currently maintains 14 licences to search totaling 381 999 ha in south-central and southeastern New Brunswick (Figure 1: 48). At the same time, MariCo has a farmin agreement with J. A. Seglund Inc. on 22 637 ha, of which 19 047 ha are under licence to search and 3 590 are under application for four leases (Figure 1: 49). The Downey #1 well, drilled by MariCo on a Seglund licence, contains a potentially commercial quantity of natural gas. It is presently shut in and is being prepared for fracking and completion. In 1999, Bull Creek #1, a step-out well, was drilled 850 m southeast of Downey #1. The step-out well had to be abandoned short of its target depth when the bit became stuck in the hole. Additional development wells are planned for the "Downey structure" in the near future. A well licence was issued to MariCo to drill an oil well at Taylor Village late in December.

In 1999 Columbia Natural Resources of Charleston, West Virginia, through its Canadian production affiliate, Columbia Natural Resources Canada Limited (CNRC) expanded its investment in Canada by acquiring properties and establishing two new joint venture arrangements. CNRC acquired a 50% working interest in all of MariCo's New Brunswick licences and 50% interest in the Downey #1 discovery well. Also, Corridor Resources Inc. signed a joint venture agreement with CNRC by which a 50% working interest was purchased in Corridor's Sackville and Moncton Subbasin licences.

Irving Oil Limited conducted an inventory of wells and equipment at the Stoney Creek oil and gas field. The field, shut-in with production suspended, is located on a 2153 ha lease (Figure 1: 50). Currently, the lease is in the sixth year of a ten-year term.

## STATISTICS

**Federal** Mineral Exploration Expenditure Surveys are carried out by Natural Resources Canada, assisted by the New Brunswick Department of Natural Resources and Energy (Mineral Information Services). The exploration expenditures are collected through two surveys each year. The Preliminary/Forecast in September followed by the Actual in January. Table 1 summarizes the results of the most recently available surveys.

**Provincial** The Recorder's office maintains an electronic claim tracking system that is updated as applications to record are received, as claims are renewed, transferred, regrouped or expire, and as reports of work are received (Table 2, Figure 2).

Lease and licence documents and agreements issued under the various Acts are maintained and updated as required.

**Table 1. Summary of Mineral Exploration Expenditure Surveys**  
 (Source: Natural Resources Canada)

Form No.	Survey Name	No. Surveyed	General Exploration	Mine Site Exploration	Total*
Ex-1	Preliminary '98	113	7 000 000	1 600 000	8 600 000
Ex-3	Actual '98	117	6 800 000	3 100 000	9 900 000
Ex-1	Forecast '99**	113	5 400 000	2 000 000	7 400 000
Ex-1	Preliminary '99	53***	6 300 000	2 200 000	8 500 000
Ex-1	Forecast 2000	53***	6 100 000	2 200 000	8 300 000

\* Survey includes overhead expenditures.

\*\* Very little data was obtained from respondents.

\*\*\* Grouping of individual claim holders has reduced the total

## PROVINCIAL EXPLORATION AND DEVELOPMENT INITIATIVES

The Mineral Exploration Stimulation Program (MESP), an assistance program for prospectors, provides grants to help them defray prospecting costs such as chemical analysis, mileage, meals and claim registration. The program provided \$40 000 in funding to 33 applicants. The average value of the grants was \$1200.

The New Brunswick Exploration Assistance Program (NBEAP) is an assistance program for junior mining companies. It provides financial assistance of 50% of exploration costs up to a maximum of \$40 000 per project. Funding in the amount of \$350 000 was allocated for 1999–2000 by the Province, through the Regional Development Corporation. Ten applicants were approved for assistance.

The Value-Added/Mineral Processing Program (VAMP), which was launched in 1996 in accordance with New Brunswick's Mineral Policy, is designed to provide funding on a shared basis for projects that could enhance the value of New Brunswick's minerals either by processing them to a higher level, or by improving the recovery of present products. In 1999, the program funded two studies, one on an oxidation process for recovering metals, the other on the production of chemicals from industrial minerals.

**Table 2. Mineral Resource Allocation and Exploration Statistics, 1998 and 1999**

Mineral Resource Allocation (total in effect at year's end unless specified for the year)	1998		1999	
	Number	Hectares	Number	Hectares
<i>Mining Act</i>				
Prospecting Licences	1 382	---	1440	---
Claims Recorded (year)	2 500	40 000	1 771	28 336
Claims Renewed (year)	15 719	251 504	12 641	202 256
Claims Expired (year)	5 970	95 520	4 822	77 152
Claims in Effect	17 841	285 456	14 884	238 144
Coal Agreements	5	62 458	4	58 917.6
Potash Exploration Agreements	0	0	0	0
Potash Leases	2	28 052	2	20 024.2
Mining Leases	17	12 528	17	12 528
Total Agreements and Leases (above)	---	103 038	---	91 469.8
Total in Effect	---	389 104	---	341 792
<i>Oil and Natural Gas Act</i>				
Licences to Search	29	635 036	28	624 978
Leases	1	2 154	5	5 744
<i>Bituminous Shale Act</i>				
Licences to Search	1	24 610	0	0
Development Permits	2	1 077	2	1 077
Leases	0	0	0	0
<i>Underground Storage Act</i>				
Storage Exploration Licences	7	27 920	7	28 731
Storage Licences	0	0	0	0
Construction Permits	0	0	0	0
<i>Quariable Substances Act</i>				
Quarry Permits	280	---	233	---
Quarry Leases	15	629.62	15	629.62
Peat Exploration Licences	2	228	4	1955
Peat Leases	31	12 845	33	13 303.6
Peat Options	12	5 022	14	4 604
Exploration Summary	1998		1999	
	Work Reported	Value	Work Reported	Value
<i>Mining Act</i>				
Reports of Work (RW)	163 reports filed	\$8 136 433	107 reports filed	\$3 848 269
Drilling Reported in RW	268 holes (57 342 m)	\$4 050 278	143 holes (23 982 m)	\$1 598 834
Potash Exploration	---	0	---	0
<i>Oil and Natural Gas Act</i>				
	1 well (2015 m)	n/a	3 wells (5370 m)	n/a
<i>Bituminous Shale Act</i>				
	8 wells (5800 m)	n/a	1 well (387 m)	n/a
<i>Underground Storage Act</i>				
	---	0	---	0

n/a not available

February 15, 2000

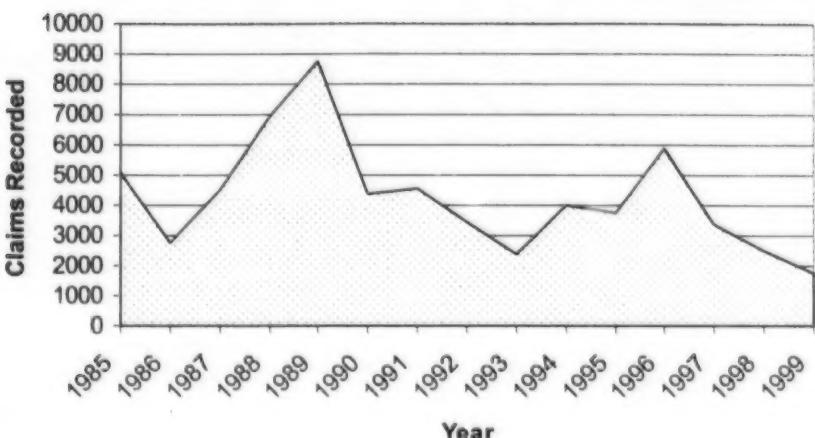


Figure 2. Mineral claims recorded, 1985–1999.

## MINES AND QUARRIES

### PRODUCTION STATISTICS

The 1999 value of mineral production (including coal) in New Brunswick is estimated to be \$857 516 900, representing very little change from the final value of \$862 992 354 in 1998 (Table 3; Figure 3). The cessation of production at the Heath Steele base metals mine, which closed at the end of October, was almost offset by a slightly higher average zinc price and a slightly lower Canadian dollar. The Canadian dollar averaged US 67.31¢ for the year, down marginally from 67.51¢ in 1998.

The value of metals production during the year was \$597 933 574, which represents 70% of the Province's value of mineral production. Noranda's Brunswick mine experienced higher throughput. CanZinco's Caribou mine remained shut down after low metal prices and metallurgical difficulties had forced a suspension of operations in August 1998. Zinc continued to dominate the metals sector, with a value of \$456 260 342, which represents 76% of the total value of metals. The value of zinc production increased approximately 4% from 1998, despite a fractional decrease in the total amount of zinc produced. The average price of zinc increased by 5% between 1998 (46.5¢/lb. [U.S.]) and 1999 (48.8¢/lb. [U.S.]). The average exchange rate of the Canadian dollar was not a factor in the value of production, as it remained almost unchanged from the year before. Lead contributed \$54 839 306 to the value of metal production, down 12% from 1998. Production of lead fell by 8%, while the price fell by 5%. The 1999 average London Metal Exchange price for lead was 22.8¢/lb. (U.S.), down from 24.0¢/lb. (U.S.) in 1998. The value of copper production decreased by almost 29%, to \$24 788 014. This is attributable to both a drop in the copper price (\$0.71/lb. in 1999 vs \$0.75/lb. in 1998) and lower production (a decrease of 25%). Antimony, bismuth, and cadmium continued to be produced as by-products from the Brunswick operation. The value and total production of all the by-product metals increased. Gold production dropped substantially (68% of the 1998 total) and the value fell even further, due to a lower average gold price in 1999. Silver production was similarly affected, with a 13% decrease in production compounded by a 6% drop in the average price.

**Table 3. Mineral Production in New Brunswick, 1998 and 1999**  
 (Source: Natural Resources Canada)

Commodity	Unit	1998 Final		1999 Preliminary	
		Quantity	Value (\$)	Quantity	Value (\$)
<i>Metals</i>					
Antimony	kg	*	*	*	*
Bismuth	kg	175 000	1 951 075	248 600	2 767 415
Cadmium	kg	133 043	124 529	234 717	136 371
Copper	kg	14 152 800	34 745 123	10 561 574	24 788 014
Gold	g	*	*	*	*
Lead	kg	79 327 798	62 192 994	72 924 609	54 839 306
Silver	kg	253 639	66 975 527	220 441	55 732 996
Zinc	kg	288 826 858	439 016 823	285 698 398	456 260 342
TOTAL			609 944 183		597 933 574
<i>Nonmetals</i>					
Marl	t	*	*	*	*
Peat	t	402 448	50 382 490	444 491	57 557 627
Potash	t	*	*	*	*
Quartz (silica)	t	*	*	*	*
Salt	t	*	*	*	*
Sulphur (in smelter gas)	t	102 362	6 789 671	105 453	7 868 903
TOTAL			188 890 558		191 993 876
<i>Fuels</i>					
Coal	t	270 000	22 850 000	260 000	21 600 000
TOTAL			22 850 000		21 600 000
<i>Structural Materials</i>					
Lime	t	*	*	*	*
Sand and Gravel	t	4 336 363	*	4,661,481	*
Stone	t	3 499 995	20 796 027	3 666 568	22 582 327
TOTAL			41 307 613		45 989 450
GRAND TOTAL (CDN)			\$ 862 992 354		\$ 857 516 900

\* confidential information

GRAND TOTAL 1997 (CDN \$) \$ 953 071 135

The nonmetals sector of the industry contributed \$191 993 876 (22%) to the value of mineral production, a 2% increase over the 1998 value. The largest contributor to the value of nonmetals production is potash. Both the value of potash and production decreased slightly from 1998 levels. Peat, the second largest contributor (\$57 557 627) to the value of nonmetals production, represented 30% of the value of nonmetals. Both the amount and value of peat produced were higher than in 1998. Salt and sulphur in smelter gas ranked next in value of production, with quartz and marl being minor contributors to the nonmetals sector.

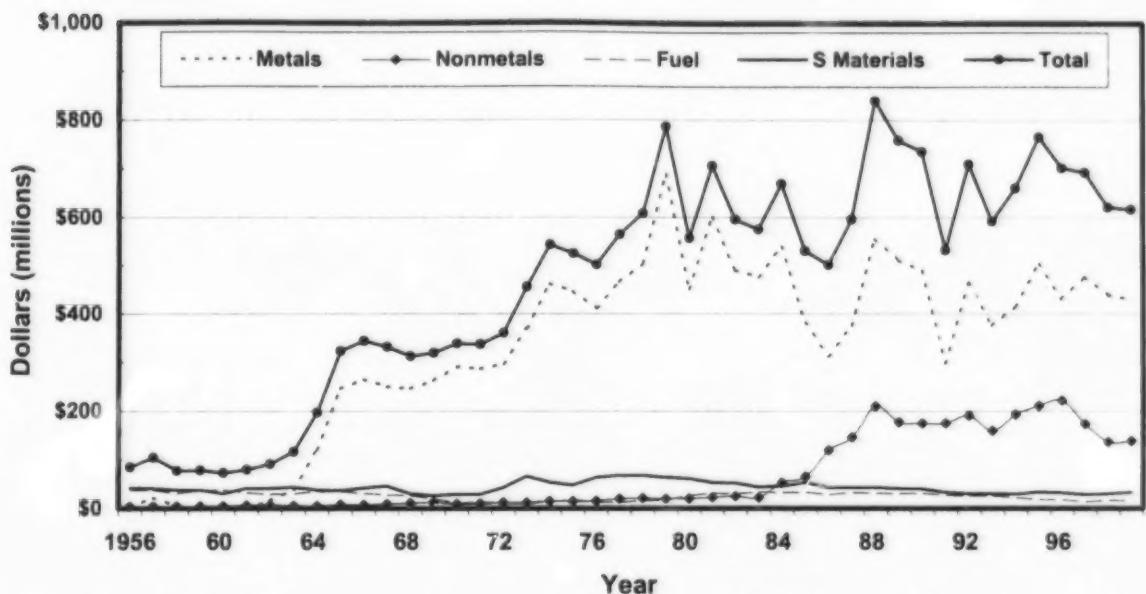


Figure 3. Value of mineral production in New Brunswick, 1956–1999. Source: Natural Resources Canada. (1986 = 100).

The value of coal produced by N.B. Coal Limited in the Minto–Chipman area (Figure 4: 1) fell by 5% to \$21 600 000. Coal production decreased by 4%.

The value of production for structural materials (lime, stone, sand and gravel) increased 11% to \$45 989 450. Sand and gravel production was up 7% while stone production increased by 5%. These commodities provide the raw material for the construction industry in New Brunswick.

## METALLIC MINERALS

### Operating Mines

*Noranda Inc. – Brunswick Mine* was able to increase production to more than 9 300 t/d. In 1996, the company had reduced target production to 9 000 t/d from the previous target of 10 500 t/d because of a marked increase in seismic activity, which resulted in some areas becoming unavailable for mining.

In 1999, Brunswick Mine brought two major capital projects on stream. The paste backfill system was commissioned in 1998 to replace the existing rock fill system. In addition to offering environmental and cost benefits, paste fill is expected to enable better ground control. Also in 1998, Brunswick commissioned an autogenous (AG) mill in the concentrator in order to replace a number of smaller mills and improve operating efficiency. After some modification of the original design, the mill was in full operation in 1999.

Zinc accounts for approximately 70% of the value of Brunswick's production. Lead, copper and silver represent most of the remaining 30%. Both mine and smelter (Figure 4:2a and 2b) ran uninterrupted

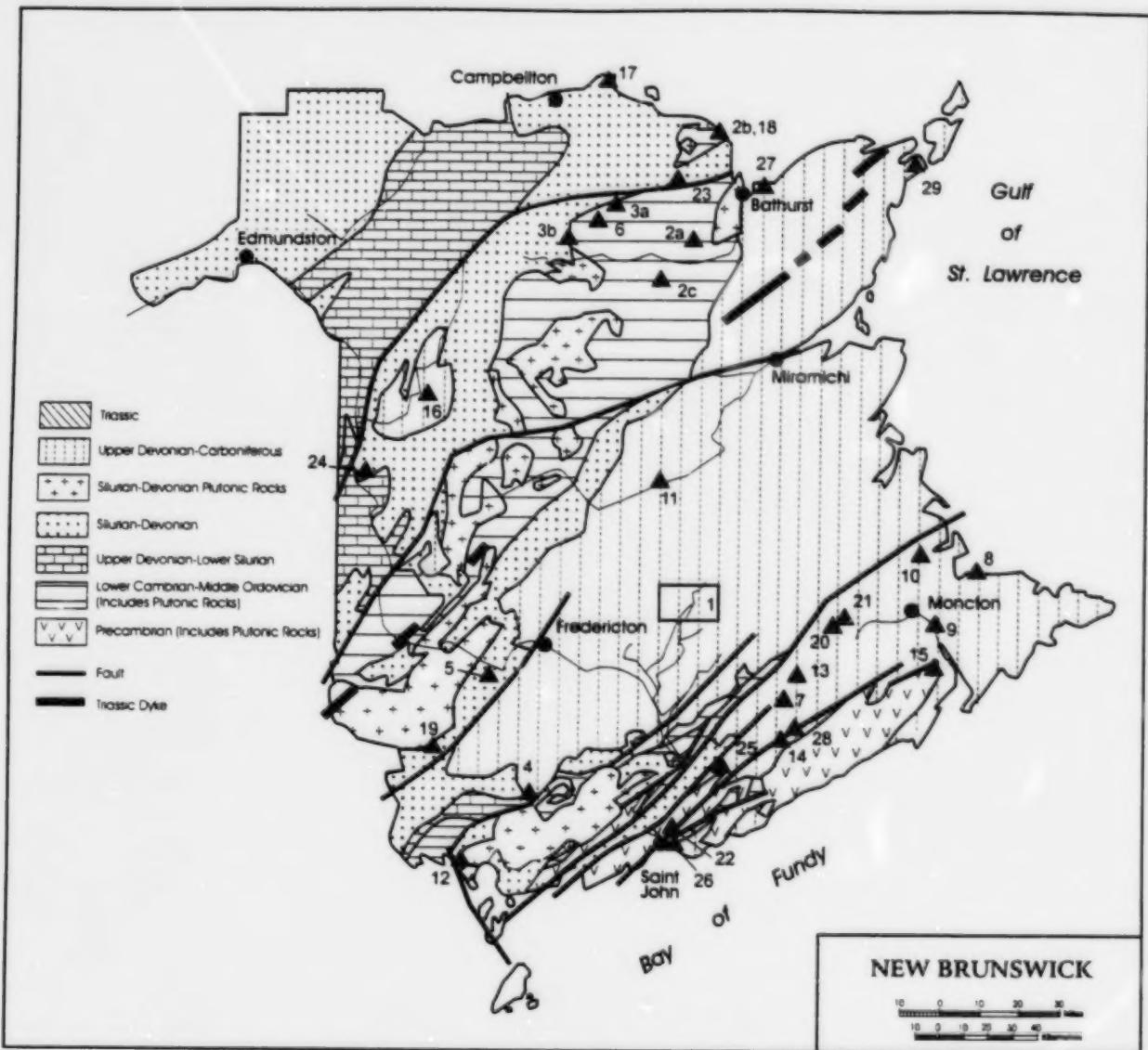


Figure 4. Mines and quarries in New Brunswick, 1999 (including two northern New Brunswick power-generating facilities).

1. Minto-Chipman coalfield (N.B. Coal Limited) coal
- 2a. Brunswick No. 12 mine (Noranda Mining Inc.-Brunswick Mine) Zn, Pb, Cu, Ag
- 2b. Belledune smelter (Noranda Mining Inc.-Smelter)
- 2c. Heath Steele mine (Noranda Mining Inc.-Heath Steele Mine) Zn, Pb, Ag, Cu
- 3a. Caribou mine (Caribou Mine Division of CanZinc Ltd.) Zn, Pb
- 3b. Restigouche mine (Caribou Mine Division of CanZinc Ltd.) Zn, Pb, Ag, Cu
4. Mount Pleasant deposit (ADEX Mining Corporation) Sn, In, Zn, Bi, W
5. Lake George mine (APOCAN Inc.) Sb
6. Murray Brook mine (Murray Brook Resources Inc. (a wholly owned subsidiary of NovaGold Resources Inc.)) Au, Ag, Cu
7. Sussex (Nelson Monuments Ltd.) dimension stone
8. Shediac area (Smith Cut Stone & Quarries Ltd.) dimension stone

throughout the year. There were no shutdowns for inventory correction or lack of feed. The company is still aggressively seeking reductions in its operating costs and continues to implement the previously planned workforce reduction from approximately 1000 employees to 800.

*Noranda Inc.-Heath Steele Mine* After intermittent operations since the 1950s, Heath Steele Mine finally closed on October 29, 1999, due to depletion of ore reserves. In the years leading up to the shutdown, Heath Steele management and union, as well as provincial government staff, worked on a Transition Adjustment Committee to assist employees in managing the eventual termination of their employment. In cooperation with Provincial regulators, the company is now working intensively on design details related to reclamation and closure associated with the site (Figure 4: 2c). Some major elements of site reclamation, such as the water treatment plant and buffer pond, have already been commissioned and are now operating. Demolition of buildings is in progress.

*Caribou Mine Division of CanZinco Ltd.*, a wholly owned subsidiary of Breakwater Resources Ltd. commenced production from its two properties (Figure 4: 3a and 3b) in mid-1997, with the first ore going through the mill in July.

As part of the new operating plan, the Caribou concentrator was extensively modified and expanded. It was redesigned to produce separate zinc and lead concentrates, rather than a bulk concentrate as was the case when it last operated in 1990. Surface preparation of the Restigouche open pit (Figure 4: 3b) began in the fall of 1996. The first ore was produced in the spring of 1997. All ore from the Restigouche site was trucked to the Caribou mine site for processing. Notable efforts were made at Restigouche to protect the sensitive local environment.

Figure 4 (concluded)

9. Boudreau quarry (Maritime Stone Works Inc.) dimension stone
10. Notre-Dame (Bastarache Stone Quarrie) dimension stone
11. Doaktown area (Central Stone Company) dimension stone
12. Lake Digdeguash area /Bayside (McCormack Materials/Charlotte County Ports Limited) sand/aggregate
13. Sussex area mine (Potash Corporation of Saskatchewan Inc. (New Brunswick Division)) potash, salt
14. Cassidy Lake processing facility (Potash Corporation of Saskatchewan Inc. (Cassidy Lake Division)) potash, salt
15. Claims, Albert Mines area (Ken Whaley) gypsum
16. Plaster Rock area (Daniel F. Merrithew) gypsum, limestone
17. Dalhousie power-generating facility (N.B. Power)
18. Belledune power-generating facility (N.B. Power)
19. McAdam manufacturing facility (Westroc Industries) gypsum wallboard
20. Havelock area quarries (Havelock Lime (a Division of Goldcorp Inc.)) limestone
21. Havelock area quarry (Lafarge Canada Inc.) limestone
22. Brookville quarry (Brookville Manufacturing) limestone, dolomite, gypsum
23. Sormany quarry (Elmtree Resources Ltd.) limestone
24. White Mud Lake (Upper Kent Lime Works Ltd.) marl
25. French Village claims (Kingsway Materials Ltd.) limestone
26. Saint John refinery (Irving Oil Limited) sulphur
27. Bass River area deposit (Chaleur Silica Ltd. (an operation of Shaw Resources, a Member of The Shaw Group Limited) silica
28. Cassidy Lake deposit (Atlantic Silica Inc.) silica
29. Shippagan (Jiffy products (N.B.) Ltd.) peat products

Operations were suspended in September 1998 because of low metal prices and difficulties in achieving target mill recoveries. The company has conducted new metallurgical studies and revised its operating plan with a view to reopening when metal prices improve sufficiently.

### Suspended Operations

In 1997, *ADEX Mining Corporation* received a consultant's feasibility study for the development of the Mount Pleasant tin-indium-zinc-bismuth-tungsten deposit (Figure 4: 4). The conclusions were disappointing, as the estimated capital costs were too high to justify a production decision at that time. The property remains under care and maintenance.

*APOCAN Inc.* operations remain suspended at the Lake George antimony mine (Figure 4: 5). Problems with the hoisting system, as well as a slumping antimony price, forced a temporary shutdown in December 1996. Despite hopes that the price would recover sufficiently to allow a resumption of operations, high metal inventories in global markets continue to depress the price and in 1999 the mine was still under care and maintenance.

*Murray Brook Resources Inc.* (*a wholly owned subsidiary of NovaGold Resources Inc.*) Under the impact of a substantially lower copper price, the company decided in 1998 not to proceed with further mining at Murray Brook (Figure 4: 6), despite some initially encouraging results from exploration drilling at the mine site. Some reclamation work was done during the year, including the placement of the remaining stockpiled copper ore into the pit. The company has updated the approved reclamation plan for the site and intends to complete final reclamation in 2000.

## INDUSTRIAL MINERALS

In 1999, the development of industrial (nonmetallic) minerals in New Brunswick revolved around natural stone (e.g., sandstone and granite), mineral aggregates (e.g., sand and gravel, and bedrock), gypsum/anhydrite, limestone/dolomite, potash, salt, silica and potash as well as industrial mineral by-products such as sulphur and flue gas desulphurization gypsum. Several of these find their way into world markets. A summary of information on some of these commodities and their related enterprises follows.

### Natural Stone

The quarrying and working of stone for various applications, once an important sector of New Brunswick's mining industry, continues to show signs of a modest revival. Although a half dozen companies fabricate stone in the province, only a few (*Nelson Monuments Ltd.* of Sussex; *Smith Cut Stone & Quarries Ltd.* of Shédiac; *Maritime Stone Works Inc.* of Dieppe and *Bastarache Stone Quarrie* of Notre Dame, near Moncton), quarry and process local stone (Figure 4: 7-10). Both granite and sandstone quarries operated on a demand basis.

Last year, New Brunswick block sandstone was shipped to British Columbia, Ontario, and parts of the United States. Several local construction projects kept companies, such as *Maritime Stone Works Inc.*, busy manufacturing ashlar cladding and several other related stone products.

Considerable interest has been shown in developing sandstone resources in the Doaktown area of central New Brunswick where the *Central Stone Company* began preparation of a sandstone quarry site (Figure 4: 11) to produce quality flagstone and related products for decorative applications, including landscaping. Products will be sold local and exported.

### **Mineral Aggregate**

The production of mineral aggregate from bedrock and granular deposits (sand and gravel) is fairly widespread throughout New Brunswick. Because of the shortage and variability of pit-run material from many granular sources and the increasing costs of processing required to meet tighter construction specifications, there is an increasing preference for the use of bedrock or "crushed rock" as a source of mineral aggregate.

Dozens of small companies and independent contractors extract sand and gravel and related materials from numerous pits that, with few exceptions, are operated on an intermittent-demand basis. The bulk of the Province's "crushed rock" is produced from ten to fifteen quarries, most of which are strategically situated near higher-demand centres or areas lacking in quality granular materials.

An unprecedented amount of highway and related infrastructure construction has been underway in New Brunswick during the 1990s. The present focus on upgrading the Province's major highway system(s) has lead to considerable interest in locating and developing sources of high-performance mineral aggregate. Apart from meeting the increased requirements from the domestic market, the export of mineral aggregate from New Brunswick's tidewater locations began in the mid-1990s and continues to gain momentum as a realistic alternative to resource development. Beginning with shipments of sand (Figure 4:12) to the New York area, aggregate export has been expanded recently to include bedrock, quarried and processed at an industrial park immediately adjacent the port facility at Bayside in southwestern New Brunswick (Figure 4: 12). Combined annual shipments of these materials are probably in the range of 300 000 to 500 000 t and now form a significant part of port traffic at Bayside. The potential for aggregate export from New Brunswick ports is being considered by several other interests.

### **Gypsum and Anhydrite**

Gypsum was among the first minerals mined and exported from New Brunswick. Southeastern New Brunswick, known around the world for gypsum of superior quality, was the centre of a thriving gypsum industry. In 1930, the first wallboard plant in Eastern Canada was built in the village of Hillsborough by the Canadian Gypsum Company. It remained in operation for nearly 50 years.

The 1990s have witnessed several interesting developments in gypsum-related activities in the Province. Gypsum is gaining acceptance among the local farming community as a soil amendment. This has lead to a few local shipments of agricultural gypsum from the Albert Mines area (Figure 4: 15) by *Mactaquac Mining Ltd.* More recently, the *Plaster Rock Gypsum and Manufacturing Limited* has recognized the potential for agricultural gypsum in western New Brunswick and adjacent areas. In 1999, the company began establishing infrastructure for a small processing facility adjacent to its deposit a few kilometres east of the village of Plaster Rock (Figure 4: 16).

In recent years, gypsum has been produced synthetically as a combustion by-product from two fossil fuel-fired power plants in northern New Brunswick, one near Dalhousie and the other at Belledune (Figure

4: 17, 18). The Montreal-based *Canadian Gypsum Company Inc.* (CGC) utilizes gypsum produced by the spraying of limestone (locally sourced) and water through hundreds of shower heads into sulphur-laden flue gases resulting from the combustion of coal and *Orimulsion<sub>™</sub>* fuels. The gypsiferous product is a very fine-grained, dust-like material. To assist in handling this material, CGC has constructed a briquetting plant adjacent to one of the power generating stations at Belledune (Figure 4: 18). At this facility, the gypsum "dust" is compacted into pill-shaped briquettes, allowing dust-free handling and transportation. CGC takes 100% of the output from two power plants in the region, shipping approximately 200 000 t of gypsum briquettes annually through the adjacent Belledune port facility to Montreal where it is used to manufacture wallboard.

An interesting gypsum-based industry is located in western New Brunswick. *Westroc Industries*, whose parent company is BPB Industries of the United Kingdom, one of the two largest gypsum wallboard manufacturers in the world, produces wallboard from its state-of-the-art manufacturing facility at McAdam (Figure 4: 19). The company imports approximately 200 000 t of gypsum feedstock each year through the Bay of Fundy Port of Bayside, 60 km to the south (Figure 4: 12). The plant has undergone several operational improvements over the last few years and markets most of its products in the United States.

### **Limestone and Dolomite**

Production at New Brunswick's limestone and dolomite operations has followed the steady upward trend of this sector over the last few years. Between 700 000 and 900 000 t of limestone and dolomitic limestone are processed annually from five operations (*Havelock Lime, a Division of Goldcorp Inc.* of Havelock; *Lafarge Canada Inc.* of Havelock; *Brookville Manufacturing* of Saint John; *Elmtree Resources Ltd.* near Bathurst and *Upper Kent Lime Works Ltd.*, north of Bristol) (Figure 4: 20–24). The limestone industry manufactures a range of chemical and pulverized products featuring agricultural and calcined/hydrated lime, and flue gas desulphurization limestone as well as aggregate. In recent years, considerable research has been directed toward the development of new value-added lime and limestone products.

In 1999, limestone production throughout the Province will likely exceed a record of 1 200 000 t. Although the magnitude of this production increase is believed to be short term, the establishment of a new quarry in the Havelock area (Figure 4: 20) and the expansion of an existing limestone operation in the French Village area (Figure 4: 25) should see the Province's annual production maintained at or slightly above 1 000 000 t.

In the Havelock area, Havelock Lime has been extending its reserves of high-calcium limestone (Figure 4: 20). Quarry expansions are in the preliminary planning stages at two locations. Development activity at its Samphill quarry will result in the extraction of 1 700 000 t of construction aggregate over the next two years. Under the terms of a special agreement, the Maritime Road Development Corporation is removing and processing low-chemical-grade limestone and related overburden material from Havelock's Samphill quarry to meet the strategic material requirements for the new Fredericton to Moncton highway project in this part of New Brunswick. Excavation of the overburden will assist in the economic recovery of the underlying reserves of steeply dipping, high-calcium limestone, thus extending life of the quarry by several years.

In order to raise funds to redevelop its Red Lake gold mine in northwestern Ontario, Goldcorp announced late in 1999 that it was selling the Havelock Lime operation to Graymont Ltd. of British

Columbia. Graymont with its wholly owned subsidiaries (Continental Lime, the Genlime Group, Graybec Calc Inc., and Bellefonte Lime Co. Inc.) is a privately owned Canadian corporation that is the fourth largest lime producing company in North America. The Havelock facility, to be known as Havelock Lime Limited, is to be closely associated with the company's three lime plants and quarries in Quebec operated by its subsidiary, Graybec Calc Inc.

In 1999, Lafarge Canada Inc. continued to supply limestone from its Havelock quarries (Figure 4: 21). Approximately 60 000 t were shipped to the company's cement plant in Brookfield, Nova Scotia where it was processed into specialty cement products. In addition, 10 000 to 15 000 t of aggregate were supplied to its ready-mix concrete plant in Sussex and to special environmental projects in the region. The company's McGee quarry continued to be operated by Havelock Lime under a limestone supply arrangement in which annual shipments of 400 000 t of rock were to be delivered to its calcining and related processing facility nearby. In another co-operative venture, Lafarge processed and stored about 40 000 t of magnesium limestone for Havelock Lime. Lafarge continued with the ongoing reclamation of quarries on its properties, nearly completing work at its former East Quarry site.

Near French Village in southern New Brunswick, *Kingsway Materials Ltd.* has initiated development of a limestone quarry in Neoproterozoic carbonates and associated rocks (Figure 4: 23). Some of this material is being considered for export through the nearby Port of Saint John, situated 25 km to the southwest.

In west central New Brunswick, a few kilometres south of the village of Plaster Rock (Figure 4: 16), the Plaster Rock Gypsum and Manufacturing Limited continued to show interest in developing a small deposit of nodular limestone for agricultural use.

### **Potash**

Despite the recent loss of one of the Province's two mines, potash still remains a major contributor to the total value of the New Brunswick's mineral production, where it maintains a position second only to zinc.

A world-class potash mining and processing facility, owned by the *Potash Corporation of Saskatchewan Inc. (New Brunswick Division)* [PCS (NB)], is situated in the southeastern part of the Province, 5 km east of the Town of Sussex (Figure 4: 13). All processed tailings are returned underground, making it a closed circuit or "zero effluent" operation.

In the spring of 1998, a small brine inflow was discovered in one section of the mine. Since its detection, PCS (NB) officials have undertaken several mitigative strategies, including a surface and underground drilling and grouting program and a 60–70 km three-dimensional seismic survey from surface over the mined area to assess any structural features that might be linked to the inflow. Toward the end of 1999, considerable progress had been made in resolving the inflow situation.

The inflow had not affected production at PCS (NB) in 1998. In fact, production for the year exceeded previous records (approaching 783 000 tons of product) and was close to the operation's annual reported capacity. [Potash Corporation of Saskatchewan Inc. 1999. Annual Report for 1998]

Early in 1998, PCS concluded the purchase of the Potash Company of Canada's former Potacan Mining Company operation at Cassidy Lake in southern New Brunswick (Figure 4: 14) following the mine's flooding and subsequent closure in 1997. The facility, now called PCS (*Cassidy Lake Division*), utilizes the existing processing facility and related infrastructure to upgrade standard grade potash imported from the company's operations in Rocanville, Saskatchewan. The operation has an annual milling capacity of 780 000 tons and an annual compaction capacity of 600 000 tons of granular potash product (*U.S. Geological Survey. 1999. Potash: 1998 Annual Review. p. 3*). This higher-value material is shipped to markets in eastern Canada and the United States. Almost 300 000 t were compacted at the Cassidy Lake operation in 1998. [Potash Corporation of Saskatchewan Inc. 1999. Annual Report for 1998]

### **Salt**

Over half a million tonnes of salt is produced each year by *Potash Corporation of Saskatchewan Inc. (New Brunswick Division)* from its potash operation near Sussex, New Brunswick (Figure 4: 13). Although some salt is consumed within the region, most is trucked to and exported from the Port of Saint John. The material is sold exclusively to Cargill Salt, a division of Cargill Incorporated.

### **Sulphur**

Since 1960, *Irving Oil Limited* has recovered sulphur from the oil refining process at its Port of Saint John refinery (Figure 4: 26). Plant capacity is reported at 200 t/d. [Natural Resources Canada. 1998. Mining and Mineral Processing Operations in Canada, Minerals and Metals Sector]

Natural Resources Canada reports that 105 453 t of sulphur (Table 3) were recovered from the smelting of ores from Noranda Inc.'s operations in northern New Brunswick.

### **Silica**

New Brunswick supports two silica operations. In the Bass River area of northern New Brunswick (Figure 4: 27), a quartzose sandstone has been excavated by *Chaleur Silica Ltd. (a Division of The Shaw Group)* as a source of flux for a nearby lead smelter. A second operation, *Atlantic Silica Inc.*, produces a wide range of specialty silica products from a rather unique deposit of quartzose sand and gravel in the Cassidy Lake area of southern New Brunswick (Figure 4: 28).

### **Peat**

Preliminary figures compiled by New Brunswick's Department of Natural Resources and Energy (DNRE) staff indicate that peat shipments in 1999 totalled about 11 800 000 standard bales with inventories standing at 3 700 000 bales early in the summer. About 12% of the production is shipped in a value-added form.

Eighteen companies were producing from 33 peatlands for a total area in production of 4200 ha. Most of the peat operations are located on Crown lands in the northeastern part of the Province. Four operations are located entirely on private lands. The f.o.b. value of shipments in 1999 is estimated to reach \$85 000 000 (DNRE figures). Most of the production is sold in the USA (53%) with Japan being the second largest foreign export market (19%). Direct revenue to the Province in the form of royalties will exceed

\$725 000 in 1999. During peak production, approximately 1160 people (including seasonal workers) were employed by the peat industry.

One company, *Jiffy Products (N.B.) Ltd.*, manufactures peat pots and peat pellets at its plant located in Shippagan, Gloucester County (Figure 4: 29). Seven primary peat producers also manufacture peat-based products, mainly growing substrates, for the professional horticultural industry.

## HYDROCARBONS

*N.B. Coal Limited*, a subsidiary of NB Power, continued production in the Minto–Chipman area (Figure 4: 1). A total of 272 173 t of coal was mined and shipped in 1999. The company continues to reclaim land disturbed by its coal mining operations.

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